Since January 2020 Elsevier has created a COVID-19 resource centre with free information in English and Mandarin on the novel coronavirus COVID-19. The COVID-19 resource centre is hosted on Elsevier Connect, the company's public news and information website.

for composite monitoring because of its piezoresistive properties. By embedding TiO_2 nanoparticles in the polymer coating, or sizing, of the carbon fibers, the piezoresistive material is evenly distributed throughout the composite. Sizing is typically applied to carbon fibers after carbonization to protect functionality, make fibers easy to handle, and help bonding with the matrix. Cleverly, the researchers piggy-back on this process to build-in strain-sensing capabilities to composites.

Carbon fiber composites embedded with TiO_2 nanoparticles show an increase in resistance in relation to increased strain, which returns to zero as soon as the pressure is removed. The addition of TiO_2 nanoparticles produces a significant increase in sensitivity to strain. The researchers also compared the mechanical properties of carbon fibers without TiO_2 nanoparticles and with different concentrations from 0.1 wt% up to 4 wt%.

Shear strength measurements, which give an indication of the adhesion between fibers and the matrix, reveal an increase from 0.5 wt% to 1.5 wt% nanoparticles, with the best showing an increase of just under 15%. Higher proportions of nanoparticles, however, lead to a decrease in strength, which the researchers attribute to the agglomeration of particles. While in small quantities nanoparticles deflect cracks and lock fibers together, in larger amounts they can propagate cracks and reduce the overall strength of composites.

Simple three-point bending tests, meanwhile, which give a measure of the viscoelastic properties of composites, show improved damping behavior with 1 wt% nanoparticles. Higher damping values are desirable in composites for the aerospace and automotive sectors for improved vibration control, fatigue reduction, and crash-worthiness.

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Improved face mask design helps fight Covid-19

Two scientists at Georgia Institute of Technology have demonstrated a new design for face masks that improves the protection they offer and brings greater comfort for the wearer. With Covid-19 still spreading around the globe, the adoption of reusable face masks has become crucial, and this design is comfortable enough to wear throughout the day and stays in place without having to be regularly adjusted.

As reported in *The Journal of The Textile Institute* [S. Park, S. Jayaraman, J. Text. Inst. (2020) doi: 10.1080/00405000.2020.1805971], the modular mask combines a barrier filtration material with a stretchable fabric. Prototypes of the face mask utilised hook and eye fasteners for the back of the head, and there is also a pocket for an optional filter to improve protection. After 20 washings, the prototypes were shown not to shrunk or lost their original shape.

The researchers are offering the design for anybody to manufacture. As co-author Sundaresan Jayaraman said "We have taken a science-based approach to designing a better mask, and we are very passionate about getting this out so people can use it to help protect themselves and others from harm". They masks are relatively easy to make as the materials can be bought from retail fabric stores, and instructions show how to measure for customization.

The masks are made from the same type of moisture-wicking fabric used in sportswear – a mix of Spandex and polyester that is washable and stretchable. The front section, the barrier component, contains the filtration material and is contoured to fit snugly while also allowing space in front of the nose and mouth to reduce breathing restriction and allow unrestricted speech.

It is hoped the technology that could lead to improved usage of reusable fabric masks and help contain the spread of the pandemic. A big problem with current reusable cloth masks is that they leak air around the edges, thus bypassing the filtration mechanism. This means virus particles can enter the air breathed in by users, as well as allowing particles from infected persons to leave the mask.

Such leakage is seen by how prone spectacles are to getting fogged up by mask wearers when they exhale, limiting those who are prepare to wear them. Also, masks that don't fit properly need constant adjustment, potentially contaminating wearers if they come into contact with their mask after touching other surfaces.

As well as moving the technology into public use as fast as possible to address the public health crisis, the pair hope to enhance the design of the mask with other types and combinations of materials, structures and fabrication methods to improve respiratory protection.

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